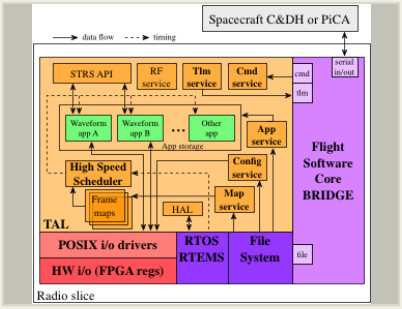
Small Business Innovation Research/Small Business Tech Transfer

Plug-In Architecture for Software-Defined Radios, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

The growing use in deep space of CubeSats is driving the need for small, flexible, full-featured telecom hardware like the Iris radio. The current Iris software is rudimentary compared the NASA Space Telecommunications Radio System (STRS). The software on each slice uses a simple 333 kHz loop as a basic scheduler to invoke small C elements. Changes can only be made before the radio is installed in the spacecraft, and no code updates in flight are possible without patching. This proposal would result in software to enable simple, low-effort elaboration of new capabilities for the Iris and similar radios. 1. Telecom Abstraction Layer (TAL) implements STRS capabilities, plus the infrastructure to dynamically select waveform applications on any sort of radio. A high-speed scheduler selects apps to run, collects execution information for debug, and reconfigures the system for needed operations. The TAL can be targeted to any radio with the modification of an i/o layer. 2. Plug-in Cognition Architecture (PiCA) running on a separate slice for cognitive link services, interfaced to each radio slice via serial. Services could include downlink rate selection in response to DSN site conditions, guaranteed data delivery, relay, antenna pointing, and access negotiation. Built-atop flight-proven VML sequencing and JPL AutoNav for spacecraft navigation, easy-to-code scripts provide sophisticated timing and event response, making cognitive services easy to write and deploy, even after launch. The longer-duration computations of the PiCA do not interfere with the high-rate waveform activities in the TAL. Both can be updated with new components at any point in the mission, allowing unprecedented flexibility to take advantage of new technologies or compensate for spacecraft idiosyncrasies. PASDR has the potential to shorten radio development cycles and allow easy collaboration between separate developers, benefiting the community as a whole.



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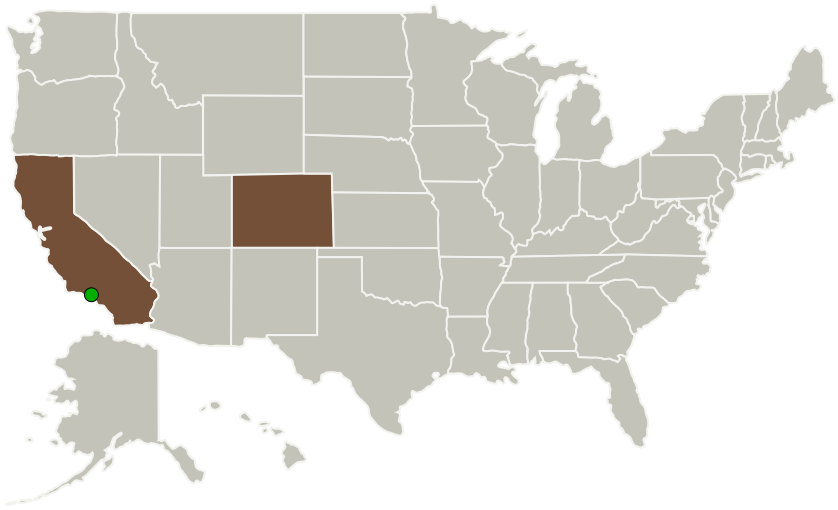
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Blue Sun Enterprise, Inc.	Lead Organization	Industry	Boulder, Colorado
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Colorado

Project Transitions

June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139879)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Blue Sun Enterprise, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

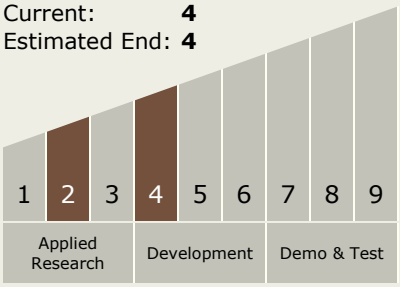
Carlos Torrez

Principal Investigator:

Christopher A Grasso

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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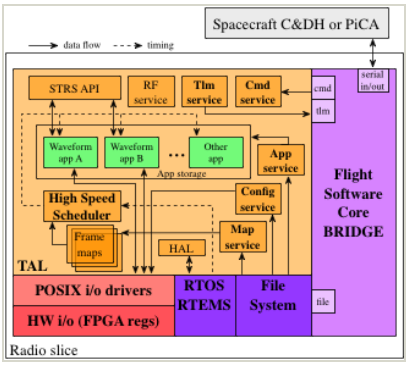
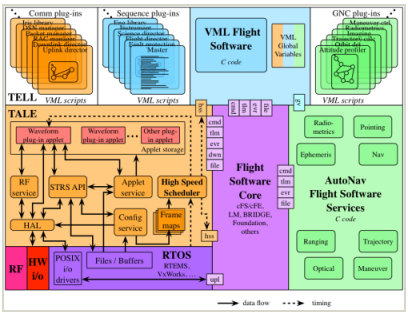
Images



Briefing Chart Image
Plug-in Architecture for Software-Defined Radios, Phase I
(https://techport.nasa.gov/image/136629)



Final Summary Chart Image
Plug-in Architecture for Software-Defined Radios, Phase I Project Image
(https://techport.nasa.gov/image/134194)

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.2 Radio Frequency
    - TX05.2.4 Flight and Ground Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System